

ON DIMORPHISM IN THE FEMALE OF *ISCHNURA*
HETEROSTICTA, BURM.

By R. J. TILLYARD, B.A.

The pretty little dragonfly, *Ischnura heterosticta*, belongs to the family *Agrionidae*, of which there are about thirty known species in Australia. Of these, six belong to the genus *Ischnura*. They are remarkable for their brilliant colours and small size. Very little is known of their habits, owing to the difficulty of collecting them. *I. heterosticta* is our largest species; the male, being very conspicuous, is often collected where the duller female is overlooked. It is common in the neighbourhood of Sydney, and extends southwards across Victoria to South Australia, while northwards it is plentiful as far as Brisbane, and probably has an extended range further up the coast. It flies from October to March.

While collecting at Cook's River in February last, I found a remarkable new female form of this species. An hour's hunting had yielded about a dozen beautifully coloured insects which appeared to be males, with half a dozen females of the ordinary dull blackish type. On examination, however, it was found that, with the exception of three, all the supposed males were in reality females; yet so closely did they resemble the male in form and colouring that the fact might easily have been overlooked.

The male differs from the typical female in having the sides of the thorax, the first two and last two segments of the abdomen brilliantly coloured with rich blue. The female has no blue markings, and the abdomen is of a uniform dull fuscous, approaching black. The abdomen of the male is very slender, with the

tip somewhat clubbed, that of the female stouter and practically cylindrical throughout. The new form of the female is intermediate in shape between the two, the abdomen being thicker than in the male, but with the tip distinctly enlarged. In colouring it almost exactly resembles the male, and bears not the slightest resemblance to the typical female. Like the latter, however, it possesses the pale pterostigma on the forewings, whereas in the male this is black.

The remarkable difference between the two forms of female is best shown by the tabular description which follows. Form A denotes the typical female, Form B the new form :—

FORM A.

Wings as in ♂ except pterostigma of forewings, pale olive-brown.

Head.—*Epicranium* black, with a transverse band of dull olive in front reaching to the eyes. *Eyes* black, with a small round olive spot at the back of each. *Post-clypeus* black. *Ante-clypeus* dull olive. *Labrum* black. *Labium* and lower mouthparts pale yellowish-grey.

Thorax.—*Prothorax* black, with a narrow olive collar. *Thorax* black above, a yellowish-brown or olive-brown stripe on each shoulder. Sides greyish; underside pale greyish.

Legs black.

FORM B.

Wings as in A.

Head.—*Epicranium* black, with a transverse band of bright bluish-green in front, reaching to the eyes. *Eyes* black, with a small round spot of brilliant blue at the back of each. *Post-clypeus* black. *Ante-clypeus* blue, separated from labrum by a black suture. *Labrum* light blue. *Labium*, etc., pale yellowish-grey.

Thorax.—*Prothorax* bronze-black, with a narrow blue collar. *Thorax* deep bronze-black above, a narrow stripe of brilliant blue on each shoulder (in some specimens this stripe is almost obsolete). Sides brilliant blue; underside pale greyish.

Legs black.

FORMA A.

Abdomen.—Shape stouter than in ♂, cylindrical.

Colour dull black or fuscous; in some specimens there is a tinge of bronze, in others, probably the most mature, a slight covering of powdery greyish bloom. Segments 8 and 9 paler, of a brownish-bronze. Underside greyish.

Appendages very small, rather blunt, separated, black.

FORMA B.

Abdomen.—Shape slightly stouter than in ♂, but not so stout as in A; the first two segments very slightly enlarged; segments 8 and 9 also somewhat enlarged, as in ♂.

Colour.—Segment 1 blue; 2 blue with a dorsal spot of deep bronze in the form of an up-turned goblet; in some specimens this spot extends over the whole dorsal surface of 2; 3-7 deep bronze; 8 bright blue; 9 bright blue, with a deep transverse black band in the suture; 10 black. Underside dull greyish.

Appendages as in A.

Forma B of the ♀ differs from the male as follows:—

The transverse epicranial band of bluish-green in Forma B is replaced by one of brilliant blue in the ♂. Abdomen more cylindrical, slightly stouter than in ♂. The appendages of course differ as usual in the sexes. In the wings the only difference is a generic characteristic, viz., the pterostigma of the forewings of the ♂ is black, while in both forms of the ♀ it is olive-brown.

It is difficult to account for the existence of Form B. We know that the genus *Ischnura* exhibits in some of its species a variation of colouring in the ♀, for an American species* has been described having a typical green ♀ and an orange form also. This, however, appears to be merely a variety in which the

* Kellicott, "Dragonflies of Ohio," p.48, *Ischnura verticalis*, Say.

ground colour has been modified; whereas in the case of *I. heterosticta* the ♀ Form B *imitates* the ♂ almost completely.*

The only possible explanation seems to be as follows:—The genus *Ischnura* contains, of all the *Agrionidae*, some of the most fragile and defenceless insects. Their powers of flight are usually confined to skimming from reed to reed over the surface of the water, rarely more than an inch or two above it, or hovering in the sun for a short period. Hence they fall an easy prey to the more rapacious species that roam over the ponds and rivers. It seems probable that the second form of ♀ may in some manner help to prevent the extermination of the species by deceiving its enemies. For the female, having a more robust abdomen than the male, would appear a far more preferable and palatable morsel, so that the species might easily be threatened with extinction by the destruction of the ova-laden females. The second form of the female might be overlooked owing to its difference of colour, and thus escape destruction.

Now *I. heterosticta* is remarkable in being a larger and more active insect than the other species of the genus. The development of the two forms may therefore, in the more robust species, have reached beyond a mere change of ground colour and involved a change in the shape of the abdomen also. It is at any rate remarkable that the change in this case is one of almost complete mimicry of the male, suggesting that the male is regarded as an unpalatable and worthless capture by its enemies in comparison with the fat and well-favoured female. It is also worthy of note that so far no second form of the female has yet been found in any other Australian species of *Ischnura*. The small size of most of the other species is perhaps a sufficient protection against their enemies.

* See also "Entomologist," Vol. xxxvii. p. 252, where is described a form of the ♀ of *Ischnura elegans*, in which the ordinary blue parts are replaced by dull olive. This, however, appears to be only a local variety. It is interesting to note that the writer, F. W. Campion, considers it a reversion to an ancestral type.—R. J. T.

One of two things, then, seems to have happened. Either, firstly, Form A is the original specific female, in which case Form B may have been evolved as a protective form, mimicking the males because of the latter's immunity from destruction; or, secondly, Form B, resembling the male so remarkably, was the original specific female, in which case Form A may have developed its sombre colouring as a protective garb for the preservation of the species, the typical female being particularly liable to destruction from its brilliant colouring. We must then suppose that the male, being less palatable and attractive, had no need of a protective guise, and therefore remained constant in form and colouring. If the second supposition be correct, we should expect the protected form of the female to become more abundant and more fertile than the unprotected form. This is at present the case, Form A being by far the more abundant, and the stouter and more developed abdomen indicating greater fecundity.

As regards the distribution of the two forms, Form A occurs wherever the male insect has been taken. Form B was found to be fairly common at Cook's River on my first visit in February last, but a second visit only yielded one specimen, while Form A was still very abundant. Form B also occurs sparingly at Mittagong, and will no doubt be found in many other localities. It is most difficult to distinguish it from the male except by careful examination, and hence the fact that it has been so long entirely overlooked.